Acta Mineralogica-Petrographica, Szeged, XXX, 93—101, 1989

PETROGRAPHIC STUDY OF THE MÓRÁGY-TYPE GRANITOID AND THE CSERDI CONGLOMERATE AT NYUGOTSZENTERZSÉBET (MECSEK MTS., SOUTH HUNGARY)

T. FEHÉR, A. MOLNÁR

Department of Petrology and Geochemistry, L. Eötvös University

ABSTRACT

The Upper Carboniferous Mórágy-type granitoids were formed by anatectic and metasomatic processes. The two macroscopically different types (medium grained granite and aplite) have the same origin. The aplite was developed in the fracture zones where the crushed rocks were potash-metasomatized more thoroughly than the surrounding granite. It has higher microcline, lower mafic mineral content and well developed cataclastic texture with more fine grained matrix than the enclosing granite.

Studies of the morphology of zircon grains provided a well detectable evolutional trend from the anatectic restites to the medium grained granite. In the course of anatexis the zircon grains developed the typical low temperature types from high temperature ones.

The source rocks of the Middle Permian Cserdi Conglomerate were Lower Permian rhyolites and granitoids of unknown age. The latter ones are strongly mylonitized but show the same metasomatic phenomena as the Mórágy-type granitoids.

The zircon types of the granitoid pebbles of the conglomerate are anatectic ones. Our opinion is that they derived from an upper part of the Mórágy-type granitoid complex.

INTRODUCTION

In the summer of 1987 the authors and LÁSZLÓ BUJTOR mapped a 6 km² area north of Nyugatszenterzsébet in the western part of the Mecsek Mts., South Hungary, on a scale of 1:10 000 *(Fig. 1.)*. This area was recently surveyed by the geological and geophysical team of the MÉV (Mecsek Ore Mines Company) on a 1:25 000 scale (KONRÁD and KONRÁD—DOBOSI, 1982).

The oldest rock is the Upper Carboniferous Mórágy-type granite. It was previously studied by JANTSKY (1979), who emphasized its anatectic origin, and by BUDA (1968, 1971, 1984, 1985) who first attributed great role to the rock-forming potash-metasomatism. BUDA has found close relationship between the granitoids occurring in the Western and also in the Eastern part of Mecsek Mountains.

The pebbles of the Cserdi Conglomerate were described by JÁMBOR (1964), KONRÁD and KONRÁD—DOBOSI (1980) and FAZEKAS (1979, 1987). Their studies showed a denudation area built up principally by rhyolites and, in a lesser amount, metamorphic rocks and granites.

In the Pliocene sandy sequence deposited here.

In the Quarternary about 30 m thick loess covered the whole area. Recent waterflows cut their valleys mainly into this loess hence the older rocks are poorly represented on the surface.

H-1088 Budapest, Múzeum krt. 4/a,

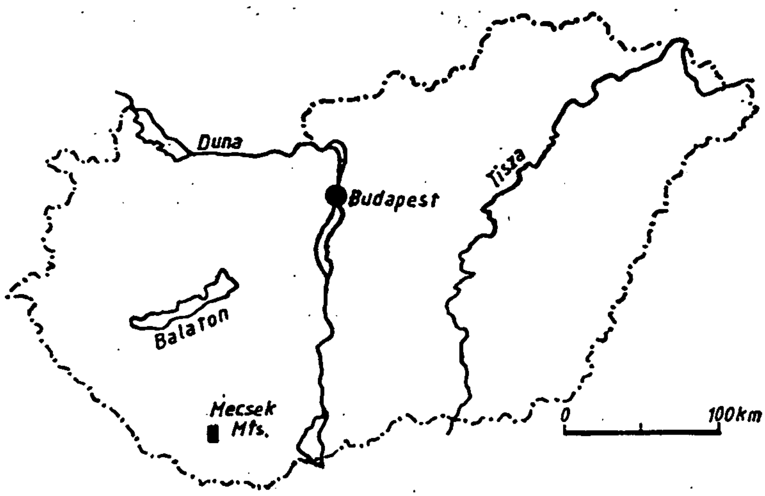

Fig. 1. Location of the mapping area

PETROGRAPHY

Mórágy-type granitoids

In the outcrops two granitoid types occur: in greater part strongly weathered granite of medium grain size (granite auct.) and in smaller part fresh fine grained granite with very small amount of biotite (aplite auct.). The latter forms dykes of varying width in the former.

The microscopic studies show that both are composed of more or less sericitized plagioclase, fresh microcline, quartz, altered biotite (colourless mica and opaques)

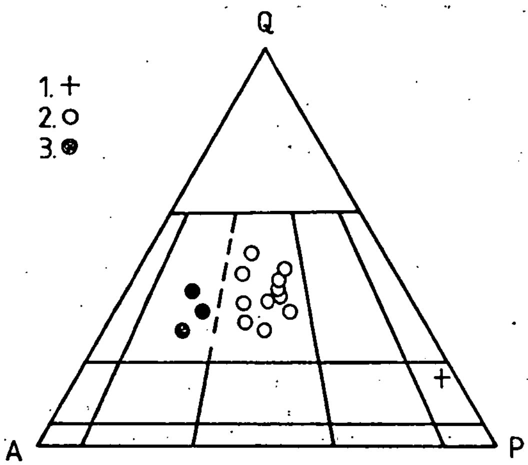

Fig. 2. The modal compositions of the different granitoid types in the QAP diagram of STRECKEISEN (1978).

1. granitoid from the outcrop 1 km north of Nyugotszenterzsébet 2. medium grained granite (Nagyváty Valley) 3. fine grained granite (Nagyváty Valley).

and apatite, zoned zircon and pyrite as accessory minerals. All samples were affected by potash-metasomatism (BUDA, 1968, 1971, 1984, 1985): sericitized myrmekitic plagioclase; plagioclase replaced by microcline.

Due to the strong weathering biotitization of amphibole, chloritization of biotite etc. (BUDA, 1985) can't be properly recognised. In fact the biotite or any other presumably original mafic mineral was opacitized or altered to a point to be unidentifiable in both rock types. The anorthite content of the plagioclase is 34—35% (universal stage results) in all samples independently of the rock type. The quartz in the medium grained variety has always wavy extinction and fragmented or crushed crystals are not uncommon. The fine grained rock type contains cataclastic matrix of recrystallized or nonrecristallized quartz.

The modal composition of the medium grained granite is monzogranitic in the diagram of STRECKEISEN (1978) with 1—5% biotite. An exception is an outcrop 1 km North of Nyugotszenterzsébet which is probably a great restite (similar inclusions were described by BUDA, 1984, from the cores of deep drilling holes) and which has 2.7% microcline and 37% biotite content. The fine grained granite ("aplite") is syenogranite with less than 1% biotite *(Fig. 2)*.

Cserdi Conglomerate

The colour of the rock is purple brown with variable grain size and pebble content. The pebbles are less rounded; 94—95% of them are rhyolites and 6—5% are granitoids. The matrix is coarse to medium grained sandstone with a weakly developed stratification dipping about 15° NNE.

The rhyolite pebbles are principally red and purple coloured and more or less silicified. Rarely the original fluidal texture can be seen in thin section. Sometimes a green coloured variety occurs with finely distributed glauconite-like mica. The phenocrysts of the rhyolite are more or less sericitized plagioclase (in the green coloured type it is always strongly altered), fairly fresh orthoclase containing patch perthite frequently with albite twins, quartz, faded and opacitized biotite sometimes with sagenitic rutile. These phenocrysts are always resorbed. In the green rhyolite pebbles there are some quartz-glauconite pseudomorphs formed presumably after pyroxene. In this rock type the alteration of the biotite is fading also just in the red variant. Accessory minerals are apatite, unzoned zircon, rutile and rarely garnet, monazite (enclosed in apatite with zircon, EMA result) in both types.

The matrix of the rhyolite is nearly always fine grained quartz, sometimes with chalcedony spherules with glauconite or limonite pigment according to the rock colour.

Dynamothermally metamorphosed pebbles, mentioned in earlier works, do not occur in this area. In these rock types, with few exceptions, we can identify the effects of potash-metasomatism just as in the granitoids now on surface.

According to the macroscopic and microscopic studies five main source rock types can be distinguished: (1) granitoid rock with pink coloured feldspar porphyroclasts (mineral assemblage: plagioclase: An_{24-28}, quartz, microcline, biotite, muscovite, apatite, titanite, zoned zircon); (2) aplite (mineral assemblage: plagioclase: An_{25-27}, microcline, quartz, muscovite, biotite, chlorite, apatite, zircon, titanite, zoisite, garnet); (3) mylonite with abundant mica (mineral assemblage: plagioclase: An_{18-22}, quartz, biotite, muscovite, apatite, zircon, garnet, titanite); (4) coarse grained quartz-plagioclase rock (mineral assemblage: quartz, plagioclase, muscovite); (5) medium grained granite (mineral assemblage: quartz, plagioclase, microcline, biotite, apatite, zircon).

As mentioned above potash-metasomatism strongly affected these rocks except mylonite and the coarse grained quartz-plagioclase rock. This appears as: plagioclase replaced by microcline; sericitized, myrmekitic and sometimes saussuritic plagioclase; chloritization, baueritization, vermiculitization (?) of biotite.

DISCUSSION OF THE PETROGRAPHY

Microscopic study of the Mórágy-type granitoid proves the macroscopically well distinguishable "aplite" and "granite" to be of the same origin. The potash-metasomatic phenomena appear in both rock types and the composition of the plagioclase are the same. The sericitization of plagioclases depend mainly on the strength of metasomatism and not on weathering. We attribute the higher microcline, lower mafic mineral content and the well develoned cataclastic texture of the "aplite" only to a more complete metasomatism in fracture zones. It would explain the cataclastic texture of the rock and we needn't suppose any magmatic differentiation.

The granitoid pebbles of the Cserdi Conglomerate show the same potash-metasomatic effects as the Mórágy-type granitoid. The main difference from the granitic rocks now on surface (except the medium grained granite pebbles) is the strongly mylonitic or cataclastic texture of the pebbles. The mylonitic texture occurs in the mica bearing types while the cataclastic one appears in the mica-poor varieties.

During the mylonitization the temperature didn't reach the degree needed for recrystallization as seen on the anomalous optical properties of the minerals (SPRY 1969), and neither was it enough for the crystallization of metamorphic index minerals.

The exact identification of the original rock types is impossible and the relationships between them are obscure because of the detrital occurrence. However we emphasize that these pebbles derive from Mórágy-type granitoid rocks and possibly from the non-granitized aureole and have been mylonitized before Middle Permian time.

ZIRCON TYPOLOGY

We followed the method of PUPIN (1980) in general but additionally we didn't cover the crystals and used a universal stage (without the upper hemisphere just for turning the crystals to every direction) and a strong table lamp for illuminating from above. With this arrangement it was possible to get a proper three-dimensional view of the grains.

We identified zircons from the following rocks: the "granite" 1 km North of Nyugotszenterzsébet; the "granite" from the Nagyváty Valley (2 km NE from Nyugotszenterzsébet); the granitoid pebbles with rose coloured feldspar porphyroclasts from the conglomerate; the rhyolite pebbles from the conglomerate.

Zircons from all granitoid types were colourless or pinkish coloured. P and S types with high T indice were mainly pinkish and were slightly resorbed while those of having lower T indice were pure, colourless and bright. This distribution didn't appear in the rhyolite though these zircons were also variably coloured and resorbed.

The zircon populations of the granites now on surface show high T indices *(Fig. 3* and *4)*. The distribution of zircon types of the granites of typically anatectic

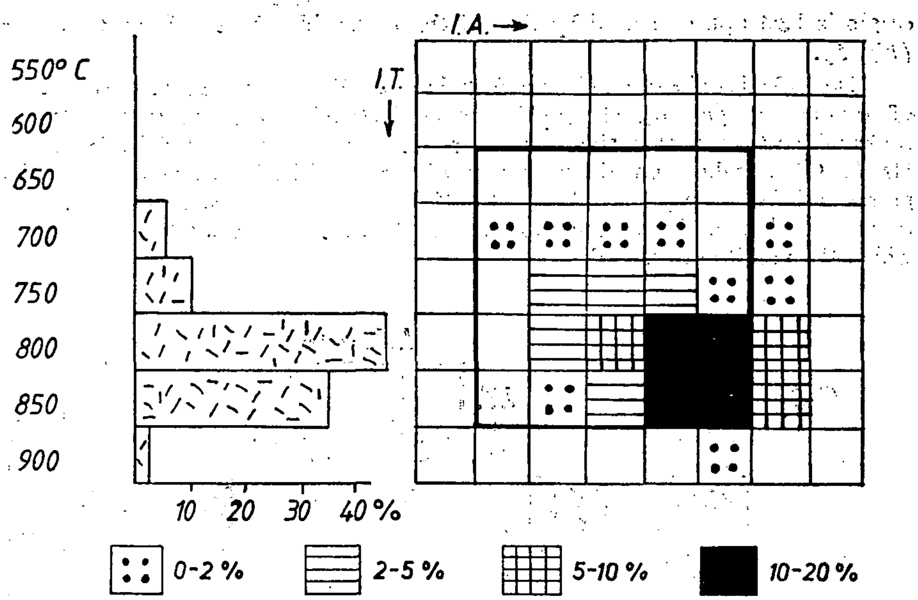

Fig. 3. Distribution of zircon types of restite (100 grains), (outcrop 1 km north of Nyugotszent-erzsébet)

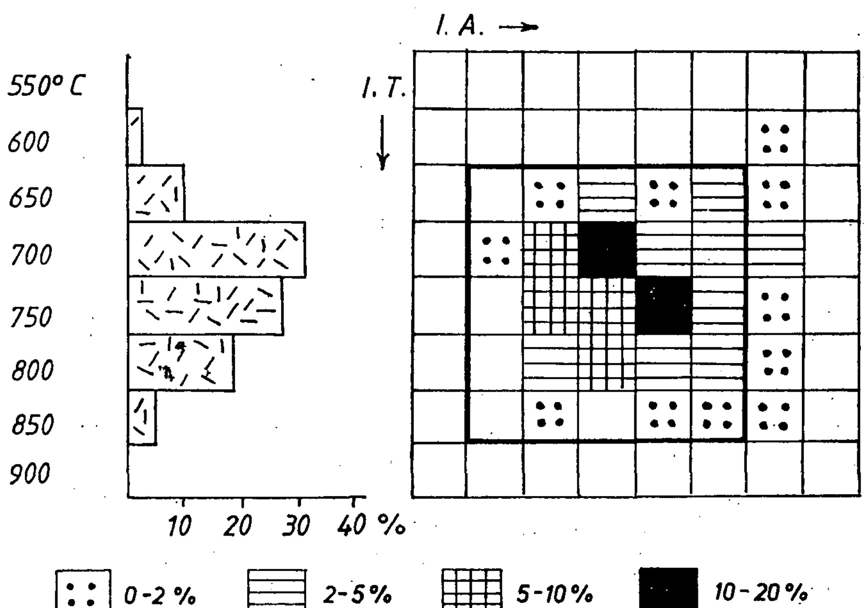

Fig. 4. Distribution of zircon type of the medium grained granite (Nagyváty Valley), 100 grains observed

origin is best approximated by that of the granitoid pebbles of the conglomerate *(Fig. 5)*.

The linked projection points make a line parallel with the longer axis of the field of granodiorites *(Fig. 6)*. The populations of the granites contain zircons of the source rocks which took part in the anatectic process. It is corroborated by GBELSKY and HATÁR (1982) who studied the zircons of the granitized metabasite and nebulitic granite of the same granitoid complex 40 km east from this occurrence. In these rocks abundant mafic inclusions represent the amphibolite facies host rocks from which the granite originated.

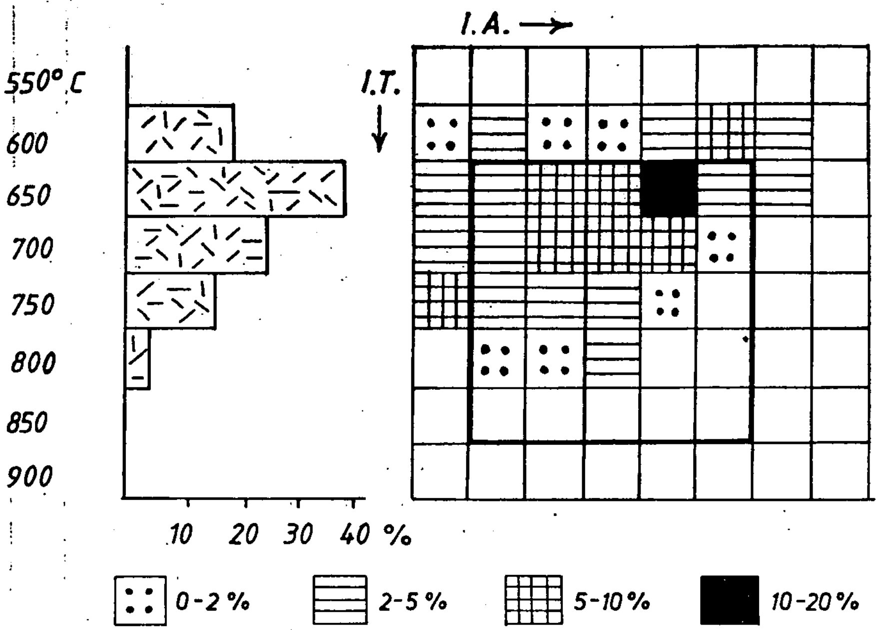

Fig. 5. Distribution of zircon types of the granitoid pebbles of Cserdi Conglomerate, 100 grains observed

Zircon morphological distribution given by GBELSKY and HATÁR (1982) is nearly the same as we got from the granitoid 1 km North of Nyugotszenterzsébet *(Fig. 3)*. This fact and the mineralogical composition provide evidence that this outcrop display a large restite (see BUDA, 1984).

More zircon types characterizing anatectic granites have been found in the rocks of the Nagyváty Valley where we haven't found any xenoliths.

As mentioned above we got the best fitting anatectic granite zircon distribution from the granitoid pebbles of the Cserdi Conglomerate *(Fig. 5)*. Comparing this and also the similar mineralogical composition and phenomena with the granitoids now on surface we think that these pebbles have been derived from an upper level of the Mórágy-type granitoid complex (see *Fig. 6*).

The zircon population of the rhyolite pebbles of the Cserdi Conglomerate covers a large area in the typological diagram *(Fig. 7)*. Some of these grains were inherited

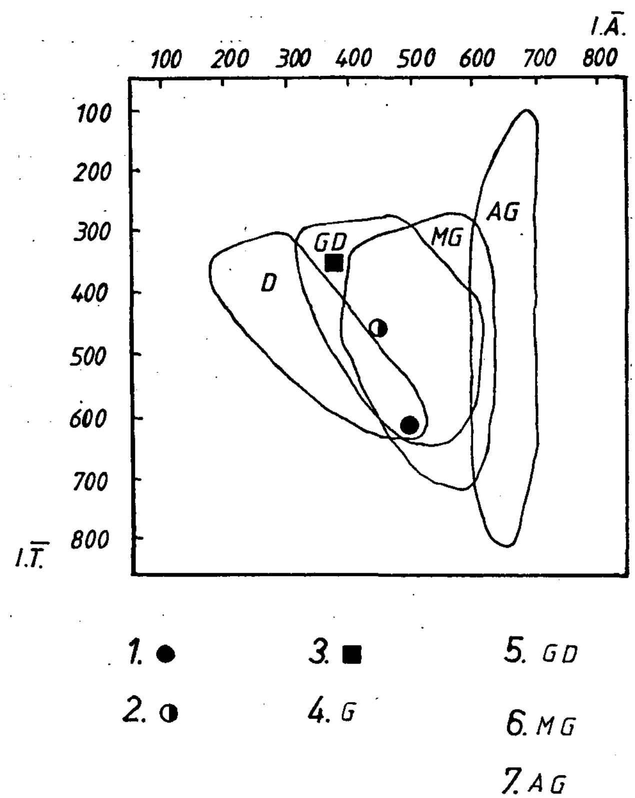

Fig. 6. Location of the projection points of the different zircon populations in the PUPIN (1980) diagram

1. restite 2. medium grained granite 3. granitoid pebbles 4. the field of diorites and tonalites 5. the field of granodiorites 6. the field of monzogranites 7. the field of alkalic granites

from the surrounding granitoid as, in some cases, the rhyolite contains small xenoliths observed in thin sections. Nevertheless, these zircons do not affect the location of the projection point of the population that is still lying in the field of calc-alkalic rhyolites *(Fig. 8)*.

CONCLUSIONS

The Mórágy-type granitoids are typical anatectic and metasomatic rocks. This is supported by microscopic studies which revealed the effects of potash-metasomatism and also the distribution of their zircon types. The different rock types (aplite-looking variety and medium grained granite) have the same origin because the former is only a more thoroughly potash-metasomatized rock body which suffered cataclasis in a fracture zone.

The granitoid pebbles of the Cserdi Conglomerate were eroded from an upper level of this granitoid complex during the Middle Permian. The source rock of these pebbles were potash-metasomatized just as the Mórágy-type granitoids. Zircon mor-

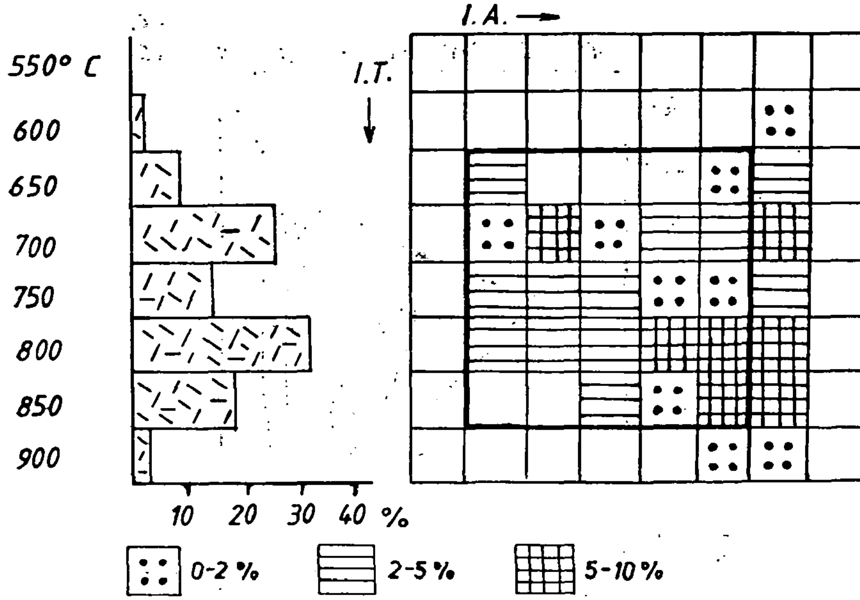

Fig. 7. Distribution of zircon types of the rhyolite pebbles of Cserdi Conglomerate

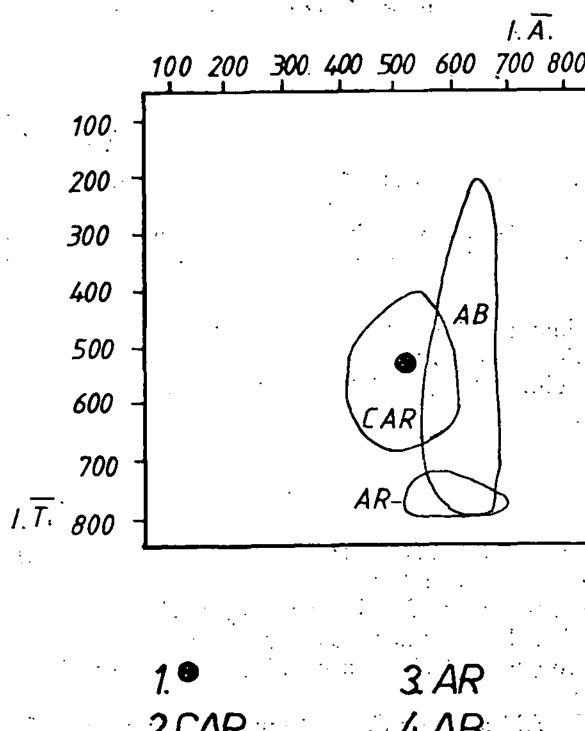

Fig. 8. Location of the projection point of the zircon population of the rhyolite pebbles .
1. projection point of the zircon population 2. calc-alkalic rhyolites 3. alkalic rhyolites 4. alkalic basalts'field (PUPIN, 1980)

phology also links these rocks together because continuous development of zircon types was observed from restite to the granitoid pebbles of the conglomerate.

The zircon types of the rhyolite pebbles differ from those of the granitoid originated ones. This may help to identify the source rock area of the finer grained detrital deposits of the same age.

ACKNOWLEDGEMENT

We would like to thank the valuable help of the Mecsek Ore Mines Company and especially of BÉLA WÉBER and VIA FAZEKAS. Our study was supported by the Department of Petrology and Geochemistry of Eötvös L. University (Budapest). We thank the valuable help of GYÖRGY BUDA and Prof. JÁNOS KISS in the interpretation of our results and MIKLÓS KÁZMÉR and ATTILA DEMÉNY for their advices.

REFERENCES

BUDA, GY. (1969): Optical and X-ray study of the feldspars of granitoid rocks of Mecsek and Velencei Mts. Unpublished Univ. Doctorate dissertation, ELTE Petr. and Geochem. Dept. Library, mauscript (in Hungarian).

BUDA, GY. (1971): Report on the mineralogical and petrographical study of the granitoid rocks investigated with deep drillings in Dunántúl. MÉV Library, manuscript (in Hungarian).

BUDA, GY. (1984): Report on the mineralogical and petrographical study of the granitoid rocks occur in the Western part of Mecsek Mts. MÉV Library, manuscript (in Hungarian).

BUDA, GY. (1985): Origin of collision granitoid rocks (Variscian Age) on the examples of Hungary, West Carpathians, and Bohemian Massif. Unpublished Ph. D. thesis, ELTE Petr. and Geochem. Dept. Library, manuscript (in Hungarian).

FAZEKAS, V. (1979): Mineralogical and petrographical study of the Lower Permian detrital formations of Mecsek Mts. and their comparison with the Kővágószőlős and Jakabhegy Formations. Survey report, MÉV Library, manuscript (in Hungarian).

FAZEKAS, V. (1987): Mineralogical composition of the Permian and Lower Triassic detrital formations of Mecsek Mts. Földtani Közlöny. **117,** 11—30. (in Hungarian).

GBELSKY, J., HATÁR, J. (1982): Zircon from some granitoid rocks of the Velenc eand Mecsek Mts. (Hungary). Geol. Carpathica. **33/3,** 343—363.

JANTSKY, B. (1979): Geology of the granitized crystalline basement of Mecsek Mts. MÁFI Évk. **60,** (in Hungarian).

JÁMBOR, Á. (1964): Lower Permian formations of the Mecsek Mts. MÉV Library, manuscript (in Hungarian).

KONRÁD, GY., KONRÁD—DOBOSI, I. (1980): Report on the pebble-study of the mineralized area in 1979. MÉV Library, manuscript (in Hungarian).

KONRÁD, GY., KONRÁD—DOBOSI, I. (1982): Documentation of the 1:25 000 scale geological map of Bükkösd area. MÉV Library, manuscript (in Hungarian).

PUPIN J. P. (1980): Zircon and granite petrology. Contribution to Mineralogy and Petrology. **73,** 207—220.

SPRY, A. (1969): Metamorphic textures. Pergamon Press, p. 350.

STRECKEISEN, A. (1978): Classification and nomenclature of volcanic rocks, lamprophyres, carbonatites and melilitic rocks. Neues Jahrbuch für Mineralogie Abh. **134,** 1—14.

Manuscript received, 15 December, 1989